IN THE CLAIMS

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

RECITATION OF PENDING CLAIMS

1. (CANCELLED)

2. (CANCELLED)

3. (PREVIOUSLY PRESENTED) An image processing apparatus processing a binary image, comprising:

an input unit that inputs the binary image as a multi-valued image;

a halftone dot image area map creating unit controlling the image processing apparatus to search for a halftone dot image area in the multi-valued image according to a process, comprising:

recognizing halftone dots in the multi-valued image,

generating a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots, as information about each recognized halftone dot ,

eliminating an erroneously recognized halftone dot according to a process, comprising:

calculating a halftone dot density in a given area by referring to the center-of-gravity information in the list of halftone dot information, and

deleting corresponding halftone dot information from the halftone dot information list, when the halftone dot density does not meet a given condition, and

creating a halftone dot image area map according to the halftone dot information list from which the erroneously recognized halftone dot has been eliminated;

a line drawing/character area map creating unit that searches for a line drawing/character image area in the multi-valued image and creates a line drawing/character image area map;

a halftone dot image binarizing unit that binarizes an input image corresponding to the halftone dot image area map created based upon the eliminating the erroneously recognized halftone dot, while suppressing input read errors occurred when said input unit inputs the binary image by optimizing a value of a target pixel to be binarized, and generates a binarized halftone dot image;

a line drawing/character smoothing unit that smoothes a jaggy contained in an input image corresponding to the line drawing/character area map, and generates a binarized line drawing/character image; and

an image combining unit that combines the binarized halftone dot image and the binarized line drawing/character image.

4. (PREVIOUSLY PRESENTED) The image processing apparatus according to claim 3, wherein said halftone dot image area map creating unit calculates a halftone dot density in one of blocks that correspond to a given area by referring to the center-of-gravity information about halftone dots in said one of the blocks and deletes corresponding information from the halftone dot image area map when the halftone dot density does not meet a given condition.

5. (PREVIOUSLY PRESENTED) The image processing apparatus according to claim 3,

wherein the generated list further comprises boundary box information, as information about each halftone dot in the recognized halftone dot image area,

wherein said halftone dot image area map creating unit performs a first process of painting out a boundary box and a second process of painting out a portion expanding from the boundary box on the basis of the boundary box information, the boundary box and the portion that have been painted out being included in the binarized halftone dot image.

6. (ORIGINAL) The image processing apparatus according to claim 5, wherein, when a gap pixel remains after the first and second processes are performed for each of all the center-of-gravity information, said halftone dot image area map creating unit paints out the gap pixel when a number of gap pixels is smaller than a predetermined threshold value.

7. (PREVIOUSLY PRESENTED) The image processing apparatus according to claim 3, wherein said line drawing/character area map creating unit detects a closed area from the multi-valued image in order to create the line drawing/character area map, said closed area corresponding to the line drawing/character area.

8. (PREVIOUSLY PRESENTED) The image processing apparatus according to claim 3, wherein said halftone dot image binarizing unit sets a proximity area close to a target pixel that is included in the input image corresponding to the halftone dot image area map and is to be binarized.

9. (ORIGINAL) The image processing apparatus according to claim 8, wherein said halftone dot image binarizing unit adaptively determines a threshold value for binarization on the basis of a distribution of pixel values in the halftone dot image area.

10. (ORIGINAL) The image processing apparatus according to claim 8, wherein said halftone dot image binarizing unit changes a value of the target pixel on the basis of the distribution, a changed value of the target pixel being used for binarization.

11. (ORIGINAL) The image processing apparatus according to claim 10, wherein, when said halftone dot image binarizing unit detects an inclination in regard of pixel values on the basis of distribution thereof, the halftone dot image binarizing unit does not binarize the target pixel in the absence of change of the value thereof.

12. (ORIGINAL) The image processing apparatus according to claim 10, wherein said halftone dot image binarizing unit determines whether the value of the target pixel should be increased or decreased on the basis of the distribution.

13. (ORIGINAL) The image processing apparatus according to claim 12, wherein said halftone dot image binarizing unit calculates the changed value of the target pixel from a maximum pixel value available in the halftone dot image area when it is determined that the value of the target pixel should be increased, and calculates the changed value of the target pixel from a minimum pixel value available in the halftone dot image area when it is determined

that the value of the target pixel should be decreased.

14. (ORIGINAL) The image processing apparatus according to claim 10, wherein said halftone dot image binarizing unit obtains a difference between the value of the target pixel and the changed value thereof, and restrains the changed value when the changed value is larger than a given threshold value.

15. (ORIGINAL) The image processing apparatus according to claim 10, wherein said halftone dot binarizing unit binarizes original values of the target pixels that are not changed and changed values of other target pixels by using a threshold value for binarization.

16. (PREVIOUSLY PRESENTED) The image processing apparatus according to claim 3, wherein said line drawing/character smoothing unit counts a number of black pixels in each row or column in a given area of the input image corresponding to the line drawing/character area map, and detects the jaggy contained in the input image on the basis of the rations of black pixels between rows or columns.

17. (ORIGINAL) The image processing apparatus according to claim 16, wherein said line drawing/character smoothing unit sets a mask in the given area to count the number of black pixels in each row or column in said mask, and shifts the mask to count the number of black pixels only in a new row or column that is not included in the mask before shifting, so that the jaggy can be detected by the numbers of black pixels before and after the mask is shifted.

18. (PREVIOUSLY PRESENTED) An image processing method that processes a binary image, comprising:

inputting the binary image as a multi-valued image;

searching for a halftone dot image area in the multi-valued image according to a process comprising:

recognizing halftone dots in the multi-valued image;

generating a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots, as information about each recognized halftone dot;

eliminating an erroneously recognized halftone dot according to a process comprising:

calculating a halftone dot density in a given area by referring to the center-of-gravity information in the list of halftone dot information;

deleting corresponding halftone dot information from the halftone dot information list, when the halftone dot density does not meet a given condition, and

creating a halftone dot image area map according to the halftone dot information list from which the erroneously recognized halftone dot has been eliminated;

recognizing a line drawing/character image area in the multi-valued image;

creating a line drawing/character image area map according to the recognizing of the line drawing/character image area;

binarizing an input image corresponding to the halftone dot image area map created based upon the eliminating the erroneously recognized halftone dot, while suppressing input read errors occurred at a time of the inputting of the binary image by optimizing a value of a target pixel to be binarized, and generating a binarized halftone dot image;

smoothing a jaggy that may be contained in an input image corresponding to the line drawing/character area map and thus generating a binarized line drawing/character image; and

combining the binarized halftone dot image and the binarized line drawing/character image.

19. (PREVIOUSLY PRESENTED) An apparatus, comprising:

an input unit to read a binary image as a multi-valued image; and

a programmed computer processor controlling the apparatus according to a process comprising:

searching for a halftone dot image area in the multi-valued according to a process comprising:

recognizing halftone dots in the multi-valued image,generating a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots, as information about each recognized halftone dot,

eliminating an erroneously recognized halftone dot according to a process comprising:

calculating a halftone dot density in a given area by referring to the center-of-gravity in the list of halftone dot information,

deleting corresponding halftone dot information from the halftone dot information list, when the halftone dot density does not meet a given condition, and

creating a halftone dot image area map according to the halftone dot information list from which the erroneously recognized halftone dot has been eliminated; and

binarizing the recognized halftone dot image area created based upon the eliminating the erroneously recognized halftone dot, while suppressing input read errors occurred at a time of the inputting of the binary image by optimizing a value of a target pixel to be binarized, and generating a binarized halftone dot image.